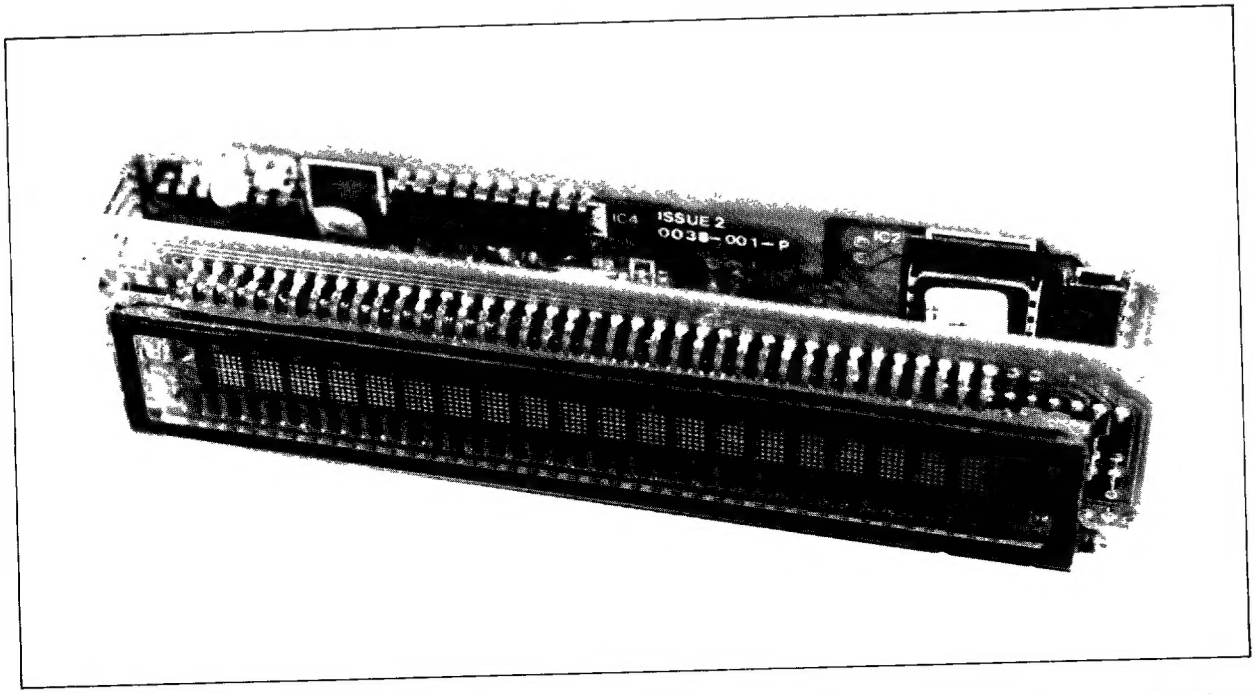
170-886

20-CHARACTER MULTI-INTERFACE DOT MATRIX VFD MODULE

MODEL No. PVM3 – 35-05-20



PULSEVIEW's PVM3 – 35-05-20 Multi-Interface intelligent display module provides efficient vacuum fluorescent technology in a compact package which accepts a range of connections to the host system. M3 modules offer a choice of clocked serial, parallel or asynchronous serial (RS-232C) interface.

FEATURES:

- Selectable clocked serial, parallel or asynchronous serial (RS-232C) interface for simple and flexible connection to the host system data bus.
- Module requires only a single 5V supply - working voltages are handled by the onboard DC/DC converter.
- A full 96-character ASCII set is provided along with 120 user-defined characters, and eight soft characters downloaded from the host system.
- Single high intensity brightness level.
- High quality blue/green (505nm) vacuum fluorescent display provides an attractive and easily readable medium. Other colours can be achieved by simple wavelength filters.
- Module incorporates its own display driver, power supply and microprocessor which contains a multi-function operating system handling scanning of display grids and setting of dot patterns.
- Hard and soft characters are provided in an attractive 5x7 dot matrix format.
- Module status can be effectively monitored by the host system.

The PVM3 – 35-05-20 Multi-Interface module is part of PULSEVIEW's extensive range of advanced opto-electronic display systems. A detailed selection guide is given on the back page.

FUNCTION DESCRIPTIONS

PULSEVIEW vacuum fluorescent display modules have four basic operating functions:

1 COMMAND DATA WRITE IN
2 DISPLAY DATA WRITE IN
3 MODULE STATUS READ OUT
4 MODULE SELF TEST

Each function is described in detail below·

COMMAND DATA WRITE IN

This function is obtained by using either single byte control codes or multiple byte control codes.

Single byte control codes handle the basic cursor functions. The table below gives the hexadecimal codes, the keyboard characters associated with them and their functions. (Note that the standard convention of using ^ to indicate a control character from the keyboard has been adopted throughout)

FUNCTION. BELL
HEXADECIMAL CODE: 07
KEYBOARD INPUT ^G
DESCRIPTION OF FUNCTION: Pin 4 of the interface plug (PL1) is set, then cleared after a preset period This can be gated with a suitable generator to give an audible tone

FUNCTION. BACKSPACE
HEXADECIMAL CODE. 08
KEYBOARD INPUT: ^H
DESCRIPTION OF FUNCTION Destructive back-space. The cursor is moved one position to the left and the character above the cursor is overwritten with a space. If the cursor is in the home position (digit 1), the code is ignored

FUNCTION: LINEFEED (SCROLL UP)
HEXADECIMAL CODE. 0A
KEYBOARD INPUT· ^J
DESCRIPTION OF FUNCTION The cursor position is maintained and the display is cleared.

FUNCTION. RETURN
HEXADECIMAL CODE· 0D
KEYBOARD INPUT ^M
DESCRIPTION OF FUNCTION· Carriage return The cursor is returned to the start of the line and the display is cleared.

FUNCTION· SHIFT <
HEXADECIMAL CODE 16
KEYBOARD INPUT ^V
DESCRIPTION OF FUNCTION: The character appearing over the cursor is deleted. The remaining characters on the line are shifted one place to the left, and a space is inserted at the right hand end of the display

FUNCTION: SHIFT >
HEXADECIMAL CODE: 17
KEYBOARD INPUT·^W
DESCRIPTION OF FUNCTION: Inserts a character in the line All characters to the right of the cursor are shifted one place to the right. The new character entered after this control code is inserted above the cursor If there is a character at the right hand end of the line, it will be lost

FUNCTION. < CURSOR LEFT
HEXADECIMAL CODE: 1C
KEYBOARD INPUT· ^\
DESCRIPTION OF FUNCTION· The cursor is moved one position to the left If the cursor is at the left hand end, the command is ignored

FUNCTION. > CURSOR RIGHT
HEXADECIMAL CODE. 1D
KEYBOARD INPUT: ^]
DESCRIPTION OF FUNCTION. The cursor is moved one position to the right. If the cursor is at the right hand end, the command is ignored.

Multiple byte control codes are used to manage more complex display features. All such codes are preceded by the control code [ESCAPE] (Hex Code 1B) and are referred to as escape sequences. The table below shows the multiple hexadecimal codes, the keyboard characters associated with them and their functions.

FUNCTION. SELECT WRAP MODE
HEXADECIMAL CODE. 1B 31
KEYBOARD INPUT· [ESC] 1
DESCRIPTION OF FUNCTION On receiving the 21st character to the display, the cursor wraps around to the home position and writes the next character there. (This function is a default when power is first applied to the module)

FUNCTION· SELECT SCROLL MODE
HEXADECIMAL CODE: 1B 32
KEYBOARD INPUT. [ESC] 2
DESCRIPTION OF FUNCTION. On receiving the 17th character, the cursor is suppressed All characters are shifted one place to the left, the next character is written into position 16, and the character at the left hand end is lost. In order to return to wrap mode, it is necessary to enter ESC 1 and perform carriage return

FUNCTION. CURSOR POSITIONING ADDRESS
HEXADECIMAL CODE: 1B 3D (V)
KEYBOARD INPUT· [ESC] [=] (V)
DESCRIPTION OF FUNCTION· The cursor is sent to the position corresponding to the value (V) which follows the code The value (V) is offset by a hexadecimal value of 19 (For example· the display digit at position 1 = Hex value 20. Thus to position the cursor at character position 12, V = 12 + Hex 19 = 2B. The code sequence will therefore be 1B 3D 2B) If the value (V) is less than Hex 20 or greater than Hex 33 the code is ignored A table showing the cursor positioning values against their hexadecimal addresses is given opposite

FUNCTION SOFT CHARACTER DEFINITION
HEXADECIMAL CODE· 1B 43 (5 byte soft character code)
KEYBOARD INPUT: [ESC] C (soft character code)
DESCRIPTION OF FUNCTION: Allows eight separate user-defined characters to be programmed into the module from the host system A full explanation of soft character definition is given on page 4.

FUNCTION· DELETE CURSOR
HEXADECIMAL CODE· 1B 44
KEYBOARD INPUT. [ESC] D
DESCRIPTION OF FUNCTION. Deletes the cursor from the display

FUNCTION ENABLE CURSOR
HEXADECIMAL CODE: 1B 45
KEYBOARD INPUT [ESC] E
DESCRIPTION OF FUNCTION: Reinstalls the cursor to the display.

FUNCTION. TOTAL SYSTEM RESET
HEXADECIMAL CODE· 1B 52
KEYBOARD INPUT· [ESC] R
DESCRIPTION OF FUNCTION: Resets the module, clearing the display and the input buffer. Default conditions are re-established and soft characters are not defined

DISPLAY DATA WRITE IN

Data is downloaded to the input buffer in the form of 8-bit words from the host system in both clocked serial and parallel input modes. In asynchronous serial mode, the expected RS-232C format is 1 start bit, 8 data bits, no parity, 2 stop bits. Figures 1,2 and 3 give timing diagrams for the three data input modes. Figures 5 and 6 show recommended RS-232C connections using a transistor and an integrated circuit respectively

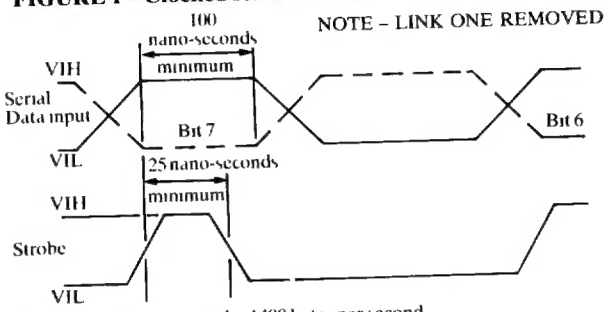
[illegible]

The module status read out (Plug 1, Pin 3) will go to logical 1 whenever a byte of data is written to the module It will remain at logical 1 for a maximum of 900 micro-seconds

[illegible]

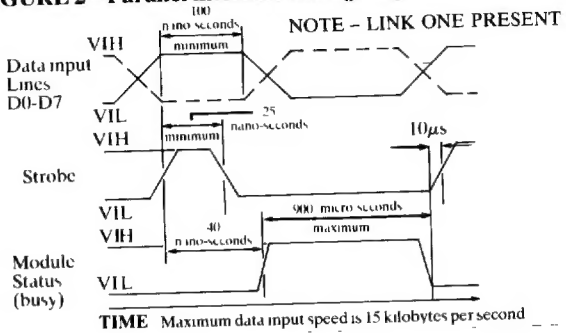
The module incorporates a self-test facility initiated by the serial in/self test input being taken low before powering up the module, or by writing [ESC] T to the module after power-up If the [ESC] T command is used, this can be cancelled by writing [ESC] R to the module, otherwise the module will have to be switched off and re-powered to cancel this facility

FIGURE 1 – Clocked serial interface timing diagram



Maximum data input speed is 1400 bytes per second

FIGURE 2 – Parallel interface timing diagram



TIME Maximum data input speed is 15 kilobytes per second

FIGURE 3 – Asynchronous serial interface timing diagram

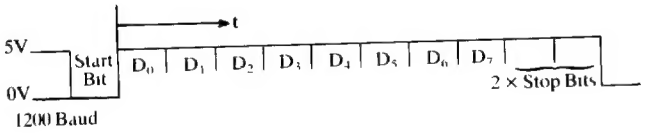
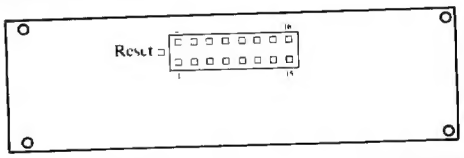


FIGURE 4 – Pin connections



PIN No	CLOCKED SERIAL	PARALLEL	ASYNCHRONOUS SERIAL
1	+5V	+5V	+5V
2	+5V	−5V	+5V
3	X	Busy Status	X
4	Beep Output	Beep Output	Beep Output
5	Strobe Input	Strobe Input	X
6	Test Input	Test Input	Serial In/Self Test
7	X	Data D1	X
X	X	Data D2	X
9	X	Data D3	X
10	Data Input	Data D0	X
11	X	Data D4	X
12	X	Data D5	X
13	X	Data D6	X
14	X	Data D7	X
15	0V	0V	0V
16	0V	0V	0V

(Notes X = no connection To obtain clocked serial input remove Link 1 on the circuit board)

FIGURE 5 – Example of asynchronous serial connection using a transitor

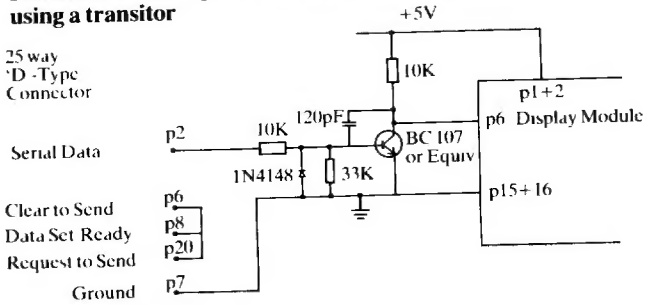


FIGURE 6 – Example of asynchronous serial connection using SN75189 type integrated circuit

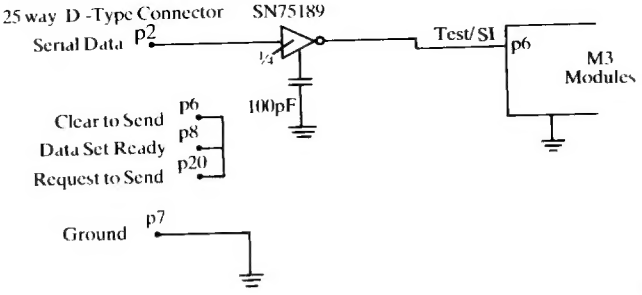


FIGURE 7 – 5 × 7 DOT Matrix patterns available

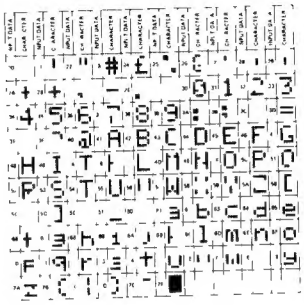


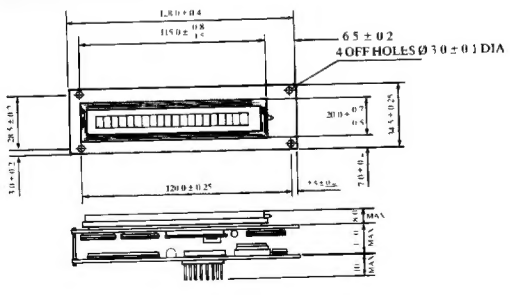
FIGURE 8 – Hexadecimal cursor positioning address values, with their corresponding display digit positions.

CURSOR POSITION (DIGIT NO)	HEXADECIMAL VALUE	CURSOR POSITION (DIGIT NO)	HEXADECIMAL VALUE
1	20	11	2A
2	21	12	2B
3	22	13	2C
4	23	14	2D
5	24	15	2E
6	25	16	2F
7	26	17	30
8	27	18	31
9	28	19	32
10	29	20	33

FIGURE 9 – General and electrical specifications

Display Format	20 characters, one row			
Character Format (see Figure 7)	5 × 7 Dot Matrix			
Characters Height (H)	5 0mm			
Character Width (W)	3 5mm			
Character pitch (P)	4 7mm			
Phosphor Colour	Blue/Green (505nm)			
Brightness Level	100 Ft L			
Character Configuration	ASCII			
	Min	Typ	Max	Unit
Supply Voltage (Vcc)	4 75	5 0	5 25	Volt DC
Host System Current Requirement		2 00	(Max 10ms)	Amp DC
Supply Current (Icc)		0 55	0 85	Amp DC
High Level Input Voltage (VIH)	2 0	5 0	5 25	Volt DC
High Level Input Current (IIH)			20	µAmp
Low Level Input Voltage (VIL)			0 8	Volt DC
Low Level Input Current (IIL)			−0 36	µAmp
High Level Output Voltage (VOH at −2 6mA)	2 40	3 40		Volt DC
Low Level Output Voltage (VOL)	0 25	0 4		Volt DC
Operating Temperature	0		+50	°C
Storage Temperature	−20		+70	°C

FIGURE 10 – Module dimensions



SOFT CHARACTER DEFINITION

The following sequence gives step-by-step instructions for defining soft characters

1. Define the character pattern on a 5 × 7 matrix (Diagram 1)

2 Redefine the matrix as 0's for unlit dots and 1's for lit dots (Diagram 2)

3. Draw up a 10 × 4 matrix, entering 0 in the first place, and 0's at the end of each line (Diagram 3). Write the 5 × 7 pattern of 0's and 1's into the new matrix, entering the lines one after the other into the new pattern (Diagram 4).

4 Convert the BINARY number appearing vertically in each column into its decimal equivalent (Diagram 5).

5. Convert each decimal number into its hexadecimal equivalent, arranged into two digit groups

   2 6 1 4 1 1 9 0 1 2 6 7 0 = 26 EB 90 C6 70

6 Reverse each two digit group to enable processing:

   62 BE 09 6C 07

THIS IS THE FIVE BYTE SOFT CHARACTER DEFINITION

7 To program the character into the module, send the [ESC] C code, then the soft character definition number and finally the five byte character definition code.

   For example, if the above character was to be loaded into the module as soft character number 6, the full code would read:

   1B 43 FD 62 BE 09 6C 07

8. To call the soft character to the display, send the appropriate ASCII code to the module. Soft characters 1 to 8 are summoned by ASCII codes F8 to FF

Dia. 1

	★	★	★	
★				★
★				★
★	★	★	★	★
★				★
★				★
★				★

Dia. 2

Line 1	0	1	1	1	0
Line 2	1	0	0	0	1
Line 3	1	0	0	0	1
Line 4	1	1	1	1	1
Line 5	1	0	0	0	1
Line 6	1	0	0	0	1
Line 7	1	0	0	0	1

Dia. 3

0									0
									0
									0
									0

Dia. 4

Line 1

0	0	1	1	1	0	1	0	0	0
0	1	1	0	0	0	1	1	1	0
1	1	1	1	0	0	0	1	1	0
0	0	0	1	1	0	0	0	1	0

Line 7

Dia. 5

0	0	1	1	1	0	1	0	0	0
0	1	1	0	0	0	1	1	1	0
1	1	1	1	0	0	0	1	1	0
0	0	0	1	1	0	0	0	1	0
2	6	14	11	9	0	12	6	7	0

PULSEVIEW offers a wide range of vacuum fluorescent display modules in different sizes and styles to cover most standard applications in consumer goods, audio and video equipment, process and industrial control, laboratory and test equipment, point of sale terminals, data logging, computer terminals etc.

Designed to simplify the engineering of an effective display function, PULSEVIEW vf modules are built for total reliability in service. All products are extensively tested to the most exacting standards.

If your requirements are not met by the standard modules detailed below, please contact PULSEVIEW's Custom Design Division.

Part No	Display Type	No of characters	No of segments	Height of characters	Width of characters	Length of display	Length of module	No of ASCII characters	No of soft characters	No of user characters	Operating voltage	Supply current	Brightness levels	Clocked serial	Parallel interface	Asynchronous serial
PV M1-14-05-16	Alpha-Numeric	16	14	5 0mm	3 0mm	110 0mm	116 0mm	64	0	0	5 0 VDC	0.10 Amp	32	●		
PV M1-14-10-16.05	Alpha-Numeric	16	14	9.0mm	5 0mm	175 2mm	230 0mm	64	0	0	5 0 VDC	0 30 Amp	32	●		
PV M1-14-10-16 12	Alpha-Numeric	16	14	9.0mm	5 0mm	175 2mm	230 0mm	64	0	0	12 0 VDC	0.30 Amp	32	●		
PV M1-16-12-16	Alpha-Numeric	16	16	12 5mm	7 0mm	205 2mm	215 0mm	64	0	0	5 0 VDC	0 4 Amp	32	●		
PV M2-35-05-16	Dot Matrix	16	5x7	5 0mm	3 5mm	97 0mm	128 0mm	96	8	120	5.0 VDC	0 6 Amp	8	●	●	
PV M2-35-05-20	Dot Matrix	20	5x7	5 0mm	3 5mm	115 0mm	128 0mm	96	8	120	5 0 VDC	0 6 Amp	8	●	●	
PV M2-35-05-40	Dot Matrix	40	5x7	5 0mm	3 5mm	219.0mm	231 0mm	96	2	120	5 0 VDC	1.0 Amp	8	●	●	
PV M2-35-05-402	Dot Matrix	80 2 rows×40	5x7	5 0mm	3 5mm	220 0mm	250.0mm	96	0	120	5 0 VDC	1 3 Amp	1	●	●	
PV M2-35-15-16	Dot Matrix	16	5x7	15.0mm	7.9mm	205 0mm	220 0mm	96	8	120	5 0 VDC	0.96 Amp	8	●	●	
PV M3-35-05-16	Dot Matrix	16	5x7	5.0mm	3 5mm	97 0mm	128 0mm	96	8	120	5.0 VDC	0.6 Amp	1	●	●	●
PV M3-35-05-20	Dot Matrix	20	5x7	5 0mm	3.5mm	115.0mm	128 0mm	96	8	120	5 0 VDC	0.6 Amp	1	●	●	●
PV M3-35-05-40	Dot Matrix	40	5x7	5 0mm	3 5mm	219 0mm	231 0mm	96	8	120	5 0 VDC	1.0 Amp	1	●	●	●
PV M3-35-05-402	Dot Matrix	80 2 rows×40	5x7	5 0mm	3.5mm	220 0mm	250 0mm	96	2	120	5 0 VDC	1 3 Amp	1	●	●	●
PV M3-35-15-16	Dot Matrix	16	5x7	15.0mm	7 9mm	205.0mm	220.0mm	96	8	120	5 0 VDC	0 96 Amp	1	●	●	●

* SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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